

# 5-5

## Indirect Proof

 **Content Standard**  
Extends G.CO.10 Prove theorems about triangles . . .

**Objective** To use indirect reasoning to write **proofs**

~~Indirect reasoning.~~ In **indirect reasoning**, all possibilities are considered and then all but one are proved false. The remaining possibility must be true.

A proof involving indirect reasoning is an **indirect proof**.

Take note

### Key Concept Writing an Indirect Proof

- Step 1** State as a temporary assumption the opposite (negation) of what you want to prove.
- Step 2** Show that this temporary assumption leads to a contradiction.
- Step 3** Conclude that the temporary assumption must be false and that what you want to prove must be true.

In the first step of an indirect proof you assume as true the opposite of what you want to prove.

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**Got It?**

1. Suppose you want to write an indirect proof of each statement. As the first step of the proof, what would you assume?
  - a.  $\triangle BOX$  is not acute.
  - b. At least one pair of shoes you bought cost more than \$25.

To write an indirect proof, you have to be able to identify a contradiction.



**Got It?** 2. a. Which two statements contradict each other?

- I.  $\triangle XYZ$  is acute.
- II.  $\triangle XYZ$  is scalene.
- III.  $\triangle XYZ$  is equiangular.

**Problem 3** Writing an Indirect Proof

**Given:**  $\triangle ABC$  is scalene.

**Prove:**  $\angle A$ ,  $\angle B$ , and  $\angle C$  all have different measures.

**Think**

Assume temporarily the opposite of what you want to prove.

Show that this assumption leads to a contradiction.

Conclude that the temporary assumption must be false and that what you want to prove must be true.

**Write**

Assume temporarily that two angles of  $\triangle ABC$  have the same measure. Assume that  $m\angle A = m\angle B$ .

By the Converse of the Isosceles Triangle Theorem, the sides opposite  $\angle A$  and  $\angle B$  are congruent. This contradicts the given information that  $\triangle ABC$  is scalene.

The assumption that two angles of  $\triangle ABC$  have the same measure must be false. Therefore,  $\angle A$ ,  $\angle B$ , and  $\angle C$  all have different measures.



**Got It?** 3. **Given:**  $7(x + y) = 70$  and  $x \neq 4$ .

**Prove:**  $y \neq 6$

write word for  
word always  
negation (repeats #1  
and #3)  
given statement  
prove statement